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Specification

The following text should be added the specification at line 7 on page 5:

<u>Figure 9 is an illustration of the shape of the floating-trailing shield in an embodiment of the invention. The section is taken perpendicular to the ABS.</u>

The paragraph in the specification beginning on page 8, line 3 is amended as follows:

Figures 7 and 8 are illustrations of a section of a head according to the invention taken perpendicular to the ABS. These figures show the relative magnetomotive potentials (ϕ and ϕ_0) of the return pole piece P1 41, the main pole piece P3 43 and the floating-trailing shield 44. In Figure 7 illustrates the potentials when no magnetic medium is present. In this case the floating-trailing shield is, in fact, magnetically floating. Figure 8 illustrates magnetic storage device 25 such as disk drive with a head according to the invention and a magnetic medium 22 with a soft underlayer 46 confronting the head 20. In this case the floating-trailing shield 44 is, in effect, shorted to the soft underlayer 46. The return pole piece P1 41, the floating-trailing shield 44 and the soft underlayer 46 are all at zero. The hard ferromagnetic recording layer 47 does not play a significant role in the magnetic circuit analysis.

The paragraph in the specification beginning on page , line 22 is amended as follows:

The data presented in Figures 4-6 was obtained by finite element modeling using commercially available software. The relevant parameters for the modeling were a pole of width 120 nm, thickness 120 nm, with a tapered leading edge, with a throat of 400 nm, a gap to the trailing shield of 50 nm and a trailing shield throat (thickness perpendicular to ABS near the pole) of 50nm. The thickness of the shield on the wafer would be 200nm minimum (in the down-track direction) and the width of the floating shield was about 15 microns in the cross- track direction. These parameters are appropriate for use with a head-to-underlayer spacing of 50 nm, and should be scaled for use with other values of head-to-underlayer spacing proportionately. Optionally the thickness of the shield perpendicular to the ABS may be increased for distances greater than about 1 micron from the center of the main pole piece (track) to improve mechanical integrity and allow for some non-planarity of lapping, but it is not essential to the working of the invention. <u>Figure 9 illustrates the alternative embodiment where the floating-trailing shield 44 is thicker on the sides than in the center in a section view perpendicular to the ABS.</u> Accordingly in this model the off-center thickness of the floating-trailing shield was increased to about 200nm.

Specification

The paragraph beginning on page 6, line 11 is amended to read as follows:

Figure 1 is an illustration of a section, perpendicular to the ABS, of a head 20 according to a first embodiment of the invention. The cross-hatching is not intended to represent the type of materials, but rather to provide a visual distinction among the elements. The ABS is on the left-hand side. As shown the layers are formed from the bottom up, so the read head portion is formed first in this design and can be packaged in forward flying air-bearing slider. The read sensor 35 is flanked by magnetic shields S1 and S2. The ferromagnetic write elements begin with P1 41 which is the return pole piece. P1 41 and P2 42 are magnetically connected through the center of the coil 33 to complete the yoke. The coil 33 passes between P1 and P2 and around the back of the yoke (not shown) to form the electromagnet. P1 extends to the ABS without tapering, but P2 starts tapering a small distance before the ABS and either ends or is reduced to an insignificant size at the ABS. It is preferable for P2 not to extend to the ABS, so that only the shape of P3 43 needs to be controlled. P3 is formed directly on top of and in contact with P2. P3 extends to the ABS and forms the main pole piece of the write head at the ABS. Although not visible in this view P3 is narrow near the ABS, but flares to a much wider dimension beginning at approximately the point where P2 reaches its full thickness as shown in Figure 1 as the flare point. Above P3 a layer of non-magnetic material 37 is deposited. The non-magnetic material can be a conductive metal, but can also be alumina or another insulating material. Above the layer of non-magnetic material 37 the ferromagnetic floating-trailing shield 44 is formed at the ABS and extends a short distance back from the ABS. The floating-trailing shield 44 is down-track (trails) the main pole piece 43 ~~44~~ since the magnetic recording medium will be moving from bottom to top as Figure 1 is oriented. The dimensions of the floating-trailing shield and the separation between the floating-trailing shield and P3 are important to the performance of the design. The area of the floating-trailing shield at the ABS is selected so that the reluctance between the floating-trailing shield and the ferromagnetic

medium is substantially less than the reluctance between the main pole P3 and the floating-trailing shield -- by at least a factor of ten approximately. The thickness (depth) of the floating-trailing shield 44 perpendicular to the ABS is constrained by the fact that the write field is reduced with increased thickness. Preferably the thickness of the floating-trailing shield will be less than the distance to the flare point, i.e., will be less than the length of the tip of the main pole piece P3. The floating-trailing shield must be thick enough not to saturate during operation.